

Additional note on the echinoid genus *Cyclaster* from the Late Maastrichtian of northeastern Belgium

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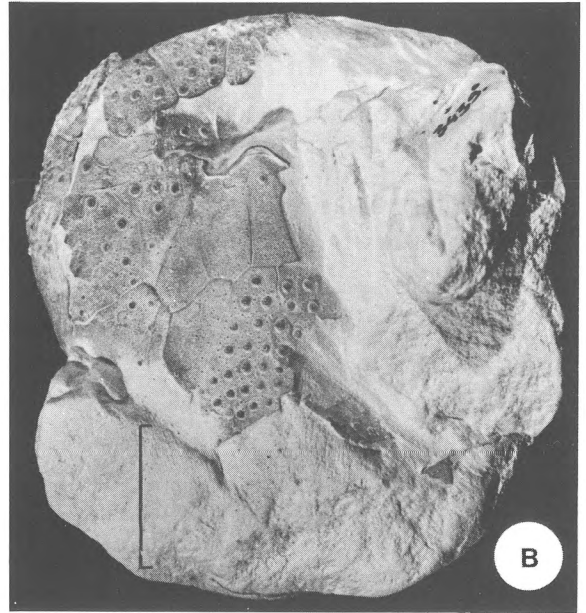
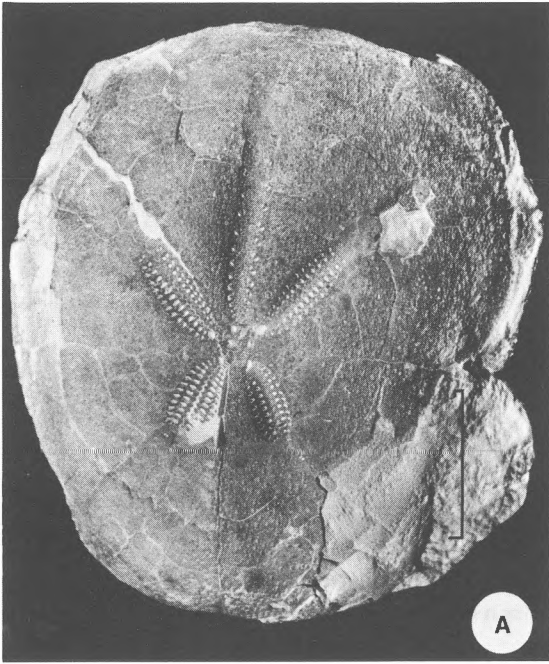
Abstract

The discovery of six additional specimens of the brissid echinoid *Cyclaster platornatus* Kutscher, 1978 in the lower part of the Vijlen Member (Gulpen Formation) as exposed at the SA Ciments Portland Liégeois (CPL) quarry near Haccourt (Liège, Belgium) enables an analysis of its range of variation. Sexual dimorphism as reflected in the size of the gonopores, which has previously been described in the literature for two species of *Cyclaster*, can now possibly be demonstrated for *C. platornatus* as well. Some remarks on the biostratigraphy and macrofauna of the Vijlen Member at this locality are added.

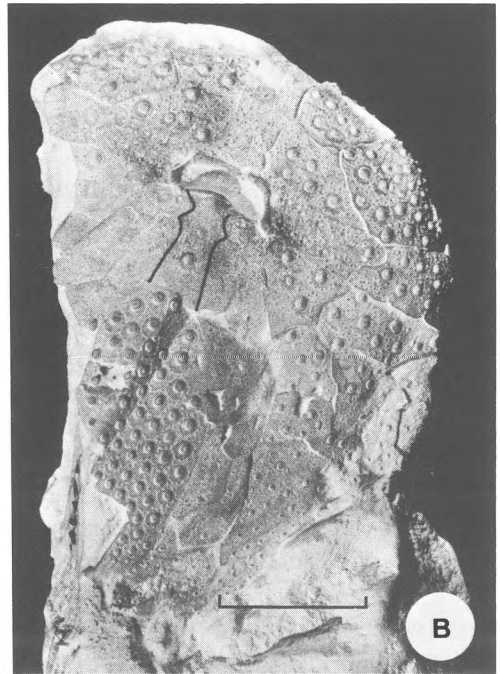
Introduction

During the printing stage of our first paper on the brissid echinoid *Cyclaster platornatus* Kutscher, 1978, and subsequent to its publication (Jagt & Michels, 1987), we succeeded in collecting six additional specimens from the same lithostratigraphic unit at the same locality, viz. the Vijlen Member (Gulpen Formation) at the SA CPL quarry, Haccourt (NE Belgium). With a small population available now, a determination of its range of variation has become possible. Where necessary, our previous description of test morphology is complemented herein. One of the specimens shows larger gonopores when compared with two other individuals that have their apical systems intact and that are of roughly the same time. This may reflect sexual dimorphism, which has previously been reported in the literature for a fossil and a modern Australian and New Zealand species of *Cyclaster*. The new material was collected from the lowermost four metres (Froidmont Horizon + 0–4 m) of the Vijlen Member (lithostratigraphic terminology of Felder, 1975).

Intensive collecting in the lower part of this member at the CPL quarry has yielded an as yet unidentified representative of the genus *Salenidia* Pomel, 1883, which represents an interesting addition to the list of echinoids in our first paper (Jagt & Michels, 1987, p. 57). Besides, a number of biostratigraphically important taxa have been found, amongst which the inoceramid bivalve *Spyridoceras tegulatus* (Von Hagenow, 1842) in particular should be mentioned. Three defective specimens (Jagt and Keutgen Collns.) are now known to us; these correspond to the species concept of Dhondt (1982; see also Abdel Gawad, 1986) (A.V. Dhondt, pers. comm.). Belemnites from this unit are invariably assignable to *Belemnitella* gr. *junior* Nowak, 1913; no *in situ* representatives of the subgenus *Belemnella* (*Pachybelemnella*) Schulz, 1979 have yet been found. Our previous record of the co-occurrence of the scaphitid ammonites *Hoploscaphites tenuistriatus* (Kner, 1850) and *H. constrictus* (J. Sowerby, 1817) has turned out to be erroneous. In contrast to definite occurrences of the former species at Mesch (southern Limburg, the Netherlands) (see Kennedy, 1987, pl. 31, figs 4–7;



Figs 1 A–B. Cycloster platornatus Kutscher, 1978. Apical and oral views of specimen no. 3439 in the Jagt Coll. CPL quarry, Haccourt. Lowermost four metres of Vijlen Member. Scale bar is 1 cm.



Figs 2 A–B. Cycloster platornatus Kutscher, 1978. Apical and oral views of specimen no. 3717 in the Jagt Coll. CPL quarry, Haccourt. Lowermost four metres of Vijlen Member. Scale bar is 1 cm.



Figs 3 A–B. *Cyclaster platornatus* Kutscher, 1978. Apical and oral views of specimen no. 3711 in the Jagt Coll. CPL quarry, Haccourt. Lowermost four metres of Vijlen Member. Scale bar is 1 cm.

Van der Tuuk, 1987, fig. 19) this species appears to be absent from the Vijlen Member at the CPL quarry. All specimens before us are assignable to *H. constrictus*, which comprises very finely as well as coarsely ribbed forms. A description of this scaphitid faunule is in preparation (Jagt, in prep.). The giant scaphitid *Acanthoscaphites varians* (Lopuski, 1911) (see Jagt & Kennedy, 1989) is now also known from this unit at this locality, which is especially interesting considering the geographic distribution of this species. It was previously only known from Denmark, Poland, the FRG and the southern part of European Russia, and is thus additional proof of a northeasterly influence during the deposition of the Vijlen Member in the Haccourt area. This influence had already been demonstrated amongst the bivalves from this member (Dhondt & Jagt, 1987; 1989). A correlation with (part of) the *tegulatus/junior* Zone of Schulz & Schmid (1983) and Schulz et al. (1984) seems unequivocal in the light of the above data.

Systematic description

Cyclaster platornatus Kutscher, 1978 Figs 1–6

Material – Six, generally well-preserved specimens from the Jagt Collection (nos. 3439, 3605, 3711, 3714, 3717 and 3822). The two previously described tests are in the Michels and Reynaers Collns. (nos. GM 713 and 149, respectively). Measurements in Table 1.

Description – Where necessary, our prior description (Jagt & Michels, 1987, pp. 58–60) is here complemented, in order to present a picture of the species' range of variation. Test relatively low; length varying from 24 to 43 mm. In ambulacrum III (A III) the miliary tuberculation varies somewhat in density in the area bounded by the peripetalous fasciole. The ambulacral pores are oblique isopores which rapidly decrease in size and become more widely spaced adambitally. The curvature of the back row of pore pairs of the paired anterior petals varies slightly. The length of the anterior paired petals is 16–19%, that of the posterior ones

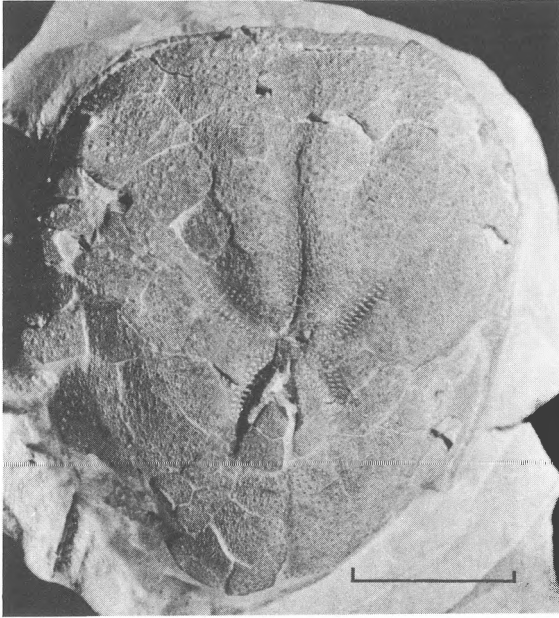


Fig. 4. *Cyclaster platornatus* Kutscher, 1978. Apical view of specimen no. 3605 in the Jagt Coll. CPL quarry, Haccourt. Lowermost four metres of Vijlen Member. Scale bar is 1 cm.

12–15% of test length. The interporal partition between the circular to elongate pores of the front row in the anterior petals becomes smaller adambitally. Outside the fasciole the pores are extremely difficult to find. The apical disc is nearly always destroyed; it is intact in only three of the specimens available for study. The sutures between the genital and ocular plates are difficult to see (Figs 6A–C); hydropores are normally confined to genital plate 2. The peripetalous fasciole is always well developed, but becomes diffuse on interambulacra 2 and 3 and across A III.

Plastron is amphisternous, with the suture between plates 2a and 2b running nearly straight or distinctly oblique. Labral plate (Figs 1B, 2B and 3B) fairly constant in shape, with a variable number of tubercles, and with a slightly convex or concave posterior border and a distinct rim projecting over the peristome anteriorly. Length of labral plate is 16–20% of test length. Width of peristome is 17–20% of test width. Larger isopores with a bulbous interporal partition are found around the peristome; there are 3 per column in A III, 3 or 4 per column in A I and A V, and 5 or 6 per column in

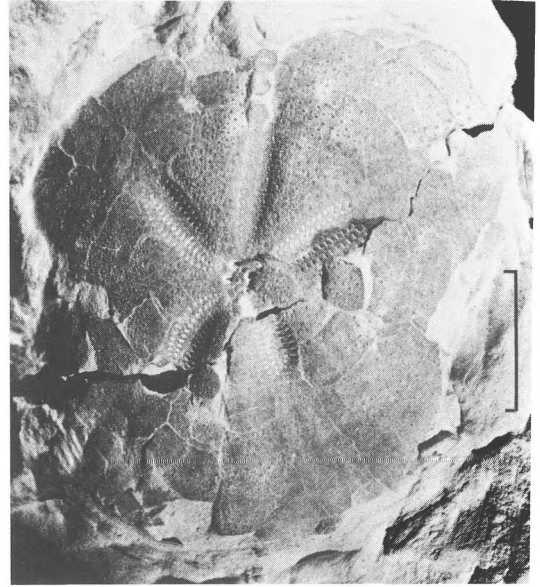


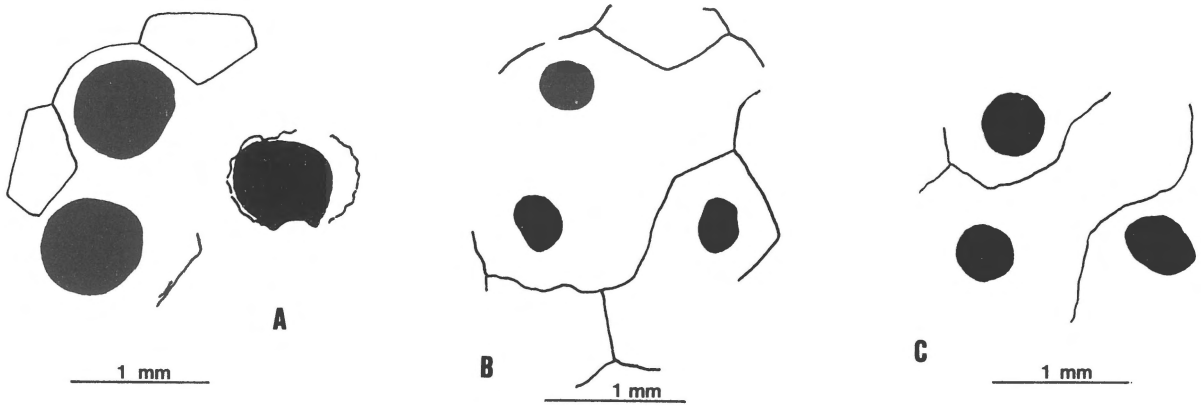
Fig. 5. *Cyclaster platornatus* Kutscher, 1978. Apical view of specimen no. 3822 in the Jagt Coll. CPL quarry, Haccourt. Lowermost four metres of Vijlen Member. Scale bar is 1 cm.

A II and A IV. Epiplastronal plates (inside the well-developed subanal fasciole) are perforated by 4 isopores on each side. The periproctal area is destroyed in all specimens before us.

To summarise, the small population now available appears homogeneous; indeed, all diagnostic characters display only a limited range of variation.

Sexual dimorphism

Sexes in echinoids can be distinguished by, among other phenomena, the size of the gonopores (Kier, 1969; Müller, 1970; Smith, 1984). Females have larger gonopores than males because they produce large yolk-rich eggs. This type of sexual dimorphism has been demonstrated by Henderson (1975, p. 39, text-figs 8a–b) for *Cyclaster posita* (Hutton, 1873) from the Oligocene to Early Miocene of New Zealand. He remarked that, although the size of the gonopores of mature *Cyclaster* varies considerably, plotting the measurements obtained for 25 specimens of this species in histogram form clearly showed two separate fields (Henderson, 1975, p. 40, text-fig. 9). In addition, he reported a similar



Figs 6 A–C. *Cyclaster platornatus* Kutscher, 1978. Camera lucida drawings of the apical systems of specimens no. 3822 and 3439 in the Jagt Coll. and no. 713 in the Michels Coll. (A–C respectively). As the sutures between the genital and ocular plates are difficult to see, the drawings are outline drawings that should primarily show the differences in size of the gonopores, which are herein interpreted as indicating sexual dimorphism. The hydropores of the madreporite (genital plate 2) are not indicated.

dimorphism for the Australian Miocene *C. archeri* (Tenison Woods, 1867) and the Recent New Zealand *C. regalis* Baker, 1969. McNamara et al. (1986, p. 65, figs 8, 9) considered *C. posita* synonymous with *C. archeri*, a species widely distributed in the Upper Oligocene-Lower Miocene of southern Australia, and also recorded this type of dimorphism for this species.

Henderson (1975, p. 40) suggested that this type of dimorphism might prove to be a generic characteristic of *Cyclaster*. In order to substantiate this, all species referred to this genus (see lists in Lambert & Thiéry, 1924; Kier & Lawson, 1978) should be critically reviewed. In this respect, it is striking how gonopore size varies in specimens of *C. danicus* (Schlüter, 1897) from the Early Palaeocene of Denmark as illustrated by Asgaard (1976, figs 4, 5). In the specimens of *C. platornatus* as figured by Kutscher (1978, pl. 3, figs 1, 4 and 5) a comparable picture is seen. It is of course obvious that well-preserved material and rich collections are needed to definitely prove this type of sexual dimorphism for *C. platornatus*. On the basis of a comparison in size of the gonopores in two specimens of nearly identical test size (Figs 6A, B) it is here suggested that it does occur in this species. More material is needed to substantiate this.

Table 1. Measurements of the tests referred to *Cyclaster platornatus* and described and illustrated herein. All dimensions are approximate since none of the specimens is perfect in preservation. I/V and II/IV denote ambulacra I and V (posterior paired petals) and ambulacra II and IV (anterior paired petals)

Test (no. in Jagt Coll.)	Dimensions (in mm)	
	length	width
3439	39.8	35.8
3605	33.5	29.5
3711	37.5	31.0
3714	–	–
3717	40.5	36.0
3822	38.0	32.0

Petals	Dimensions (in mm)		Number of pore pairs	
	length anterior petals	length posterior petals	I/V	II/IV
3439	7.5	5.5	13/14	15/16
3605	5.5	4.6	13	13/14
3711	6.6	–	–	17
3714	6.9	5.3	14/15	16
3717	7.0	6.0	15/16	17
3822	7.2	5.5	15/16	17/18

Future studies

Of the brissid echinoid *Diplodetus* Schlüter, 1900, Van der Ham et al. (1987, p. 34, pl. 24, figs 1, 2) recorded two species from the Vijlen Member *s. lat.* in the Maastrichtian type area and adjacent regions, viz. *D. duponti* (Lambert, 1911) and *D. parvistella* (Schlüter, 1899). They admitted the problems that exist in species delineation in this genus. We here recommend that use of Schlüter's (1899, 1900) names, especially those introduced for material in flint preservation, be discouraged until these are fully revised (see also Radig, 1973). Stokes (1979) unfortunately did not examine Schlüter's type material, which is possibly still present in the Schlüter Collection at Bonn University. Stokes (1979) suggested that the distribution of the genus *Diplodetus* in NW Europe might have been strongly facies controlled and emphasised that occurrences in non-glaucopit calcarenites are rare. At the CPL quarry, one (possibly two) species of this genus (Jagt & Michels, 1987) occur in rather coarse-grained calcisiltites with very low glauconite content (Vijlen Member). In fine- to medium-grained calcarenites of the Lanaye Member (Gulpen Formation) this genus is also well represented (Van der Ham et al. 1987). In future echinoid studies in the Campanian-Maastrichtian of the Maastrichtian type area, full revision of the species of this genus should be given priority. An exhaustive discussion of the palaeobiology of the echinoid fauna of the Vijlen Member at the CPL quarry is now in preparation (Jagt & Michels, in prep.). Descriptions of test morphology, tuberculation, structure of pore pairs etc. will be presented in that paper, together with reconstructions of the modes of life of the various species, modelled upon the excellent discussions by e.g. Smith (1978, 1980a, b, 1984), Gale & Smith (1982) and Smith et al. (1988).

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